[10191/874]

METHOD AND RECEIVER FOR GEOGRAPHICAL SELECTION OF DIGITALLY CODED MESSAGES

The present invention relates to a method for geographical selection of digitally coded messages which are emitted from several transmitters and contain location data that are compared, in receivers, to selection data that are dependent on the respective position of the receivers, and a receiver having a device for the selection of digitally coded messages.

Background Information

Spoken traffic announcements for informing automobile drivers have already been known for some time. These announcements have a variety of disadvantages, for example delays and inaccuracies which are associated with the manual and thus also subjective reception and forwarding of the data. It may happen, for example, that an automobile driver encounters a traffic jam that has not (yet) been announced; or that despite a traffic jam warning, the road in question can be traveled with relatively little disruption when the driver arrives at the point referred to.

More accurate sensing and more rapid transmission have become possible with the aid of the system for transmitting digitally coded traffic messages that has become known ~~in the last few years~~. The configuration and coding of these traffic messages, and the location lists, are defined in CEN pr ENV12313-1 and pr ENV/278/7/3/0004, based on the proposed ALERT C standard of June 1996 issued by the RDS ATT ALERT consortium. In this context, the essential elements of a traffic message are the location of the event, and the event itself. These indications are cataloged, i.e. a unique code is assigned to each traffic-relevant location and each traffic-relevant event. Concatenation of the locations in the location table along existing roads reproduces the profile. In addition to the

usual devices of a receiving unit having an RDS decoder, devices for decoding, storing, processing, and outputting the traffic messages are required in order to use the TMC (traffic message channel).

Digitally coded traffic messages, hereinafter also called TMC messages, can be transmitted using the Radio Data System (RDS), which allows additional and inaudible transmission of digital data concurrently with broadcast programs in a data channel. The specifications of the Radio Data System for FM audio radio are defined, among other places, in the document Tech. 3244 - E, March 1984, of the European Broadcast Union (EBU). Radio receivers with suitable RDS decoders can receive and decode transmitted data, in addition to audio reception, with the same receiving section.

When the TMC system is introduced, a very large number of TMC messages may be expected, only a small portion of which are of interest to each particular automobile driver. One essential quality feature of future receivers for digitally coded messages will therefore be the ability to filter out or select, from the large number of received messages, those relevant to the driver, and thus protect the driver from information overload. Position-related selection is advantageous in this context, but requires knowledge of the position of the receiver, i.e. of the vehicle.

Various methods are known for ascertaining position - if applicable, even an approximate position. For example, the position can be entered manually via area and distance codes, but on longer journeys this is too inflexible and cumbersome. Coupling the RDS/TMC receiver to a navigation system, for example GPS, requires additional technical outlay and therefore more cost.

It is the object of the present invention to make possible position-related selection without additional control effort, and with the minimum possible technical outlay.

Summary of the Invention

In the method according to the present invention, this object is achieved in that the transmitters additionally emit selection data which characterize their respective transmission regions and which, in the receiver, are compared to location data contained in the messages.

The method according to the present invention uses only the data present in any case in the receiver for the decoding of messages. The accuracy achieved thereby is lower than in the case of a navigation system, but is nevertheless entirely adequate for the selection of messages. A change in the frequency or program information code of one or more transmitters is immaterial to the method according to the present invention, as long as the selection data emitted by the transmitter are still present.

The method can be used ~~The method can be used in particularly advantageous fashion~~ with receivers of the type which automatically search for transmitters and tune to the strongest transmitter of a desired program based on the reception conditions. In this context, the method according to the present invention can also be used in so-called one-tuner units, since field-strength measurements on other frequencies do not need to be performed.

For units with dedicated TMC tuners, it is ~~furthermore~~ advantageous that when several TMC transmitters are being received, a selection of the service can also be made on the basis of the selection data, in particular the area code. For example, if the system knows the destination of the journey, it can select the TMC service whose area code contains the

destination, since this ensures that all the messages relevant to the route of travel are selected. The method furthermore does not depend on specific RDS details, and can also be transferred to other transmission media, for example DAB, AMDS, etc.

In a first embodiment of the method according to the present invention, provision is made for the selection data to be location codes of areas which are defined for the coding and decoding of messages and fall at least partially in the transmission region. The location codes, hereinafter also called area codes, can be used directly by the receiver as a selection criterion, since all the locations defined for the coding and decoding of messages are referenced to such location codes. In other words, the only messages which pass through the filter are those whose primary or secondary location indication is located inside the territory defined by the area code.

A second embodiment of the method according to the present invention consists in the fact that the selection data are coordinates and radii of the transmission regions. In this context, the radius represents, in simplifying fashion, the range of the respective transmitter. In order to use these selection data in the receiver, the location coordinates for each location code must also be stored in the location list. Since this is also a prerequisite for a graphic depiction of the traffic situation, such data are often already contained in the location list, and can additionally be used for the method according to the present invention.

Especially in the case of transmitters with long ranges, the second embodiment can be, if applicable, more favorable, since the propagation area could be described either inaccurately by indicating a large area (a state or province), or accurately

using many small areas. Since each code requires 16 bits of transmission capacity, the decision in terms of definition at the transmitter end is then often made in favor of the inaccurate solution.

Accuracy is greatest if the respective selection data applicable to each individual transmitter are emitted ~~before it.~~ In accordance with a further embodiment of the method according to the present invention, ~~however~~, it is also possible for a group of transmitters to emit identical selection data in each case.

~~A development of the~~ The method according to the present invention ~~consists in the fact~~ provides that the selection data and reference data for the selection data are transmitted in system messages of a data stream containing the digitally coded messages. The TMC signal as defined by ALERTC, in particular, contains in each case four system messages which are differentiated via the respective first two bits of block C. In this ~~development~~ embodiment, the first of these variants with the code 00 can be used for transmission of the selection data. In this context, provision ~~is preferably~~ can be made for the following data to be transmitted in a first data block: an identifier indicating that selection data are being transmitted, the number of a location list necessary for decoding the messages in the receiver, and data concerning the type of selection data.

~~Lastly, if~~ It is to be possible both to transmit area codes and to transmit coordinates and radii, in ~~an advantageous embodiment of this development provision is made for~~ another additionally transmitting in the first data block the information concerning the type of selection data, by way of a bit which states whether the selection data consist of location codes of areas, or coordinates and radii. In the case where area codes are transmitted, it is advantageous

additionally to transmit in the first data block an indication of how many location codes of areas are to follow. In this context, a location code of an area can be transmitted in at least one further data block.

For a selection datum consisting of radius and coordinates, ~~the development~~ another embodiment of the method according to the present invention can ~~be embodied in such a way~~ provide that the radius is transmitted in the first data block, and the coordinates in a further data block.

In a receiver according to the present invention having a device for the selection of digitally coded messages which are emitted by several transmitters, contain location data, and are selected in the receiver on the basis of selection data that depend on the respective position of the receiver, the object of the present invention is achieved in that the receiver furthermore has a device for the reception of selection data which are emitted by transmitters and which characterize the transmission region of the respective transmitter, and a device for comparing the selection data to the location data contained in the messages.

In accordance with ~~a development~~ an exemplary embodiment of the receiver according to the present invention, the size of the selection area can be reduced by the fact that when several transmitters with overlapping selection data are being received, the intersection of the received selection data is used for selection.

~~Brief Description of the Drawings~~

~~Exemplary embodiments of the invention are depicted in the drawings with reference to several Figures, and are explained in more detail in the description which follows. In the~~

drawings.

Figure 1 shows a block diagram of the receiver according to the present invention;

Figure 2 shows a schematic depiction of data blocks which contain selection data;

Figure 3 shows a schematic depiction of a vehicle's journey through several transmission regions and TMC regions;

Figure 4 shows a flow chart for analyzing received selection data; and

Figure 5 shows a flow chart for selecting messages based on received selection data.

Detailed Description

The receiver depicted in Figure 1 has, in a manner known per se, an antenna 1, a receiver section 2, a stereo decoder 4, a LF amplifier 5, as well as power amplifiers 6, 7 and speakers 8, 9. The stereo multiplex signal delivered by receiver section 2 is conveyed both to stereo decoder 4 and to an RDS decoder 3 whose output is connected to a microcomputer 13. Microcomputer 13 serves to control the receiver, and also to decode and manage the TMC messages and prepare them for reproduction and selection. A keypad 14 and a display 15 are connected to microcomputer 13. Output of the selected TMC messages can be accomplished either via display 15 or as voice output, for which purpose microcomputer 13 is connected via a speech synthesizer 16 to an input 10 of LF amplifier 5.

Figures 2a and 2b each show system messages, composed ~~made up~~ of two blocks C and D in accordance with TMC specifications, in which

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the first two bits are set to 00. In an ~~in the~~ exemplary embodiment, this is intended to signify that these system messages are being used for the transmission of selection data. Thirty bits are initially available for this purpose in block C. The six bits adjacent to 00 represent a location table number LTN, since according to TMC specifications a number of location lists are possible, and the method according to the present invention takes that into account.

There follow three bits as extended service characteristics (ESC), which allow a more accurate description of the service, e.g. specific operating states or a description of the message contents. If one or more messages are currently being sent out, the following bit (ntr = nothing to report) is set to 0, while a 1 indicates that no messages about problems are present. The next bit defines the type of selection data: a 0 means that the following 19 bits contain an index and an area code. A 1 indicates that the following 19 bits contain geographical coordinates and a radius. Lastly, a three-bit IDX is provided, identifying how many of the up to eight different area codes are being transmitted.

The following 16-bit data block D transmits an area code, i.e. the location code of an area located in the location list cited in LTN.

If the selection data are being transmitted in the form of geographical coordinates and range, then as shown in Figure 2b the CID (= coordinate ID) bit is set to 1. The IDX bits are then used to transmit the radius, for example in 30-km steps from 000 = 30 km to 111 = 240 km. The second data block D transmits the X and Y coordinates, using eight bits each. The area covered by the location list is thus subdivided into 256 x 256 fields. These can then be addressed individually via the X and Y coordinates.

Figure 3 schematically shows the journey of a vehicle from a point A to a point B. In the process, the vehicle comes into range of transmitters x, y, and z, thereby traveling through areas G1 through G7. After beginning the journey, the vehicle first enters the transmission region of transmitter x. Its transmission region is covered by areas G1 through G6, so that all the messages from this area are selected. At point B, the receiver switches over to transmitter y which can now be received better. The latter indicates areas G2, G3, G5, and G6 as its transmission regions. By comparison with the areas of transmitter x (which can still be received), the receiver can now narrow down the selection to areas G2 and G3, and outputs messages only for those regions.

At point C the vehicle leaves the region of transmitter y, but can now pick up transmitter z. Although the latter can be received more weakly than transmitter x, the receiver selects that transmitter because destination E is located in area 7, and only transmitter z references that area. Thereafter, the selection takes into account only messages from areas G3 and G4, which corresponds to the intersection of the areas indicated by transmitters x and z. From point D on, messages from the destination area are also selected, since now transmitter x can no longer be received, and the creation of an intersection is superfluous.

Figure 4 shows a flow chart for the analysis of received selection data, which hereinafter will also be called selection codes. After starting at 21, in program section 22 an 8A group is fetched from the communication unit and decoded. At 23, execution branches depending on whether a group of selection codes SC is involved. If not, i.e. if the message is a standard TMC message, it is decoded at 24 and at 25 is selected based on the particular selection table currently in memory. This selection table was created by way

of previously received selection codes.

A determination is then made at 26 as to whether further 8A groups are present. If not, the program terminates at 27.

If 8A groups are still present, however, then in program section 22 an 8A group is fetched from the communication unit and decoded, and then once again checked at 23 to determine whether it is a group of selection codes SC. If so, a determination is made at 28 as to whether the CID bit (Figure 2) is set to 0 or to 1. If the CID bit equals 0, the selection codes contain location codes with which (at 29) the selection table is updated. If CID equals 1, coordinates are being received as selection codes in the same 8A group, so that (at 31) the selection table is updated with the received coordinates.

After 29 or 31, the program branches at 32 depending on whether the message count M equals zero. If not, i.e. if messages are still present in memory, selection is performed at 25 using the updated selection table. If no further messages are present, execution branches to 26.

Figure 5 shows a flow chart for the selection of messages based on received selection codes. After starting at 41, an error-corrected and verified 8A group is called at 42. The program then branches at 43, depending on whether or not a selection is active, i.e. whether a user has set a selection. If not, the message - like every other one - is marked as selected (at 44). The program then terminates at 45. If, however, the selection is active at the branching point 43, a determination is made at 46 as to whether the selection table contains coordinates. If not, a determination is then made at 47 as to whether the selection contains area codes AC. If so, a determination is made at 48 as to whether the location code

LC contained in the respective processed message is referenced to area codes AC. If so, at 44 the message is marked as selected. If not, at 49 the message is marked as not selected.

If it is ascertained at 46 that the selection table contains coordinates, then at 50 the coordinates COORD belonging to the respective location code are identified. The program then branches at 51, depending on whether location L is located outside the area A defined by the coordinates contained in the selection table. If the location is not outside that area, the program continues at 47. If, however, the location is outside the area, then at 49 the message is marked as not selected.